



Dynamic Balance
Steady State

Assumption:

Angle between SOC ($y^2 = 5, x^2 = 4$) is

$$5 - 5x^2 = 4 - x^2$$

$$5 - 4 = -x^2 + 5x^2$$

$$1 = 4x^2$$

$$4x^2 - 1 = 0$$

$$x_1 = 1/2 \quad x_2 = -1/2$$

$$y_1 = 5 - 5x^2$$

$$y_1 = \sqrt{5 - 5x^2}$$

$$y_1 = \sqrt{5 - 5(1/2)^2}$$

$$y_1 = 1.947$$

$$y_2 = \sqrt{5 - 5(-1/2)^2}$$

$$y_2 = 1.947$$

$$10x + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = -10x / 2y$$

$$\frac{dy}{dx} = -10(0.5) / 2(1.947)$$

$$\frac{dy}{dx} = -1.29$$

$$\therefore \theta_1 = \tan^{-1}(-1.29)$$

$$\theta_1 = -52.22^\circ //$$

$$2x + 2y \frac{dy}{dx} = 0$$

$$\frac{dy}{dx} = -2x / 2y$$

$$\frac{dy}{dx} = -2(0.5) / 2(1.947)$$

$$\approx -0.26$$

$$\theta_2 = \tan^{-1}(-0.26)$$

$$\therefore \theta_2 = -14.57^\circ //$$

the total angle = $\theta_2 - \theta_1$

$$= -14.57^\circ - (-52.22^\circ)$$

$$= 37.65^\circ //$$